ANNEX 1 TO APPENDIX A

Comparing Motorola's Solution 1 and the FCC's Proposed Allocation Table
Differences in Proposed DTV Allotments

MM Docket No. 87-268

ST	CITY	NTSC	FCC DTV	MOT DTV
AL	ANNISTON	40	32	24
AL	BESSEMER	17	28	16
AL	BIRMINGHAM	6	50	51
AL	BIRMINGHAM	13	55	58
AL	DOTHAN	18	24	16
AL	DOZIER	2	48	50
AL	FLORENCE	26	22	29
AL	HUNTSVILLE	19	57	52
AL	HUNTSVILLE	25	24	28
AL	HUNTSVILLE	31	29	32
AL	HUNTSVILLE	48	27	47
AL	HUNTSVILLE	54	34	41
AL	LOUISVILLE	43	42	21
AL	MOBILE	15	26	18
AL	MONTGOMERY	12	16	52
AL	MONTGOMERY	20	36	19
AL	MONTGOMERY	26	25	27
AL	MONTGOMERY	45	53	44
AL	MOUNT CHEAHA	7	52	56
AL	OPELIKA	66	18	33
AL	TROY	67	51	36
AL	TUSCALOOSA	33	39	34
AL	TUSKEGEE	22	15	35
AR	ARKADELPHIA	9	15	19
AR	EL DORADO	10	28	30
AR	FAYETTEVILLE	13	18	14
AR	FAYETTEVILLE	29	28	17
AR	FORT SMITH	5	46	32
AR	FORT SMITH	24	17	25
AR	JONESBORO	8	35	41
AR	JONESBORO	19	20	26
AR	LITTLE ROCK	2	32	47
AR	LITTLE ROCK	4	47	20
AR	LITTLE ROCK	16	19	15
AR	LITTLE ROCK	42	41	43
AR	NEWARK	17	26	29
AR	PINE BLUFF	25	14	24
AR	PINE BLUFF	38	30	18
AZ	FLAGSTAFF	2	49	38
AZ	FLAGSTAFF	4	36	42
AZ	FLAGSTAFF	13	16	17
AZ	KINGMAN	6	47	46
AZ	PHOENIX	5	42	36
AZ	PHOENIX	8	17	23
AZ	PHOENIX	15	23	16
AZ	PHOENIX	61	35	30
AZ	TUCSON	13	16	17
AZ	YUMA	11	19	18
AZ	YUMA	13	16	19
CA	ANAHEIM	56	38	32
CA	AVALON	54	31	29
CA	BAKERSFIELD	17	54	56
CA	BAKERSFIELD	23	31	42
CA	BAKERSFIELD *	39	56	51
CA	BAKERSFIELD	45	42	54
CA	CHICO	12	15	32
CA	CORONA	52	15	38
CA	COTATI	22	23	8
CA	EL CENTRO	9	18	17
CA	EUREKA	6	49	47
CA	EUREKA	13	18	15
CA	FORT BRAGG	8	11	41
CA	FRESNO	18	26	15
CA	FRESNO	47	15	48
CA	FRESNO	53	34	28
CA	LOS ANGELES	2	46	43
CA	LOS ANGELES	4	32	10
CA	LOS ANGELES	7	53	8
CA	LOS ANGELES	9	47	53
CA	LOS ANGELES	13	21	15
CA	LOS ANGELES	22	60	21
CA	LOS ANGELES	58	41	48
CA	MONTEREY	46	41	52
CA	NOVATO	68	35	23
CA	OAKLAND	2	34	29
CA	ONTARIO	46	67	47
CA	PALM SPRINGS	36	57	28
CA	PALM SPRINGS	42	43	57
CA	PARADISE	30	31	26
CA	PORTERVILLE	61	50	34
CA	REDDING	7	14	16
CA	SACRAMENTO	3	33	45
CA	SACRAMENTO	6	45	35
CA	SACRAMENTO	10	59	33
CA	SALINAS	8	43	41
CA	SALINAS	35	31	58
CA	SAN DIEGO	8	23	7
CA	SAN DIEGO	10	29	23
CA	SAN DIEGO	15	17	22
CA	SAN FRANCISCO	4	18	28
CA	SAN FRANCISCO	5	28	34
CA	SAN FRANCISCO	7	61	57
CA	SAN FRANCISCO	9	57	18
CA	SAN FRANCISCO	14	15	59
CA	SAN JOSE	11	12	43
CA	SAN LUIS OBISPO	6	10	27
CA	SAN MATEO	60	29	15
CA	SANTA ANA	40	66	41
CA	SANTA BARBARA	3	51	50
CA	SANTA ROSA	50	41	11
CA	STOCKTON	13	69	12
CA	STOCKTON	64	63	69
CA	TWENTYNINE PALMS	31	28	39
CA	VENTURA	57	43	31
CA	VISALIA	26	27	10
CA	WATSONVILLE	25	52	31
CO	CASTLE ROCK	53	47	44
CO	DENVER	2	44	38
CO	DENVER	6	36	35
CO	DENVER	59	35	43
CO	DURANGO	6	26	32
CO	GLENWOOD SPRINGS	3	45	36
CO	GRAND JUNCTION	5	48	43
CO	PUEBLO	8	23	29
CO	STEAMBOAT SPRINGS	24	14	23
CT	BRIDGEPORT	43	6	10
CT	BRIDGEPORT	49	12	6
CT	HARTFORD	3	35	11
CT	HARTFORD	18	9	35
CT	HARTFORD	24	63	47
CT	HARTFORD	61	60	58
CT	NEW HAVEN	59	46	32
CT	NORWICH	53	45	9
CT	WATERBURY	20	32	46
DC	WASHINGTON	4	36	48
DC	WASHINGTON	7	33	59
DC	WASHINGTON	9	59	33
DC	WASHINGTON	20	69	41
DE	SEAFORD	64	44	8
FL	BOCA RATON	63	31	21
FL	BRADENTON	66	23	42
FL	CLEARWATER	22	59	26
FL	CLERMONT	18	30	31
FL	COCOA	52	49	30
FL	DAYTONA BEACH	2	31	48
FL	DAYTONA BEACH	26	32	11
FL	FORT MYERS	11	53	57
FL	FORT PIERCE	21	22	16
FL	FORT PIERCE	34	16	53
FL	FORT WALTON BEACH	35	19	14
FL	FORT WALTON BEACH	58	49	25
FL	GAINESVILLE	5	42	36
FL	HIGH SPRINGS	53	40	43
FL	JACKSONVILLE	4	33	42
FL	JACKSONVILLE	7	23	10
FL	JACKSONVILLE	30	14	29
FL	JACKSONVILLE	47	10	14
FL	JACKSONVILLE	59	38	32
FL	LAKE WORTH	67	27	36
FL	LEESBURG	55	29	41
FL	LIVE OAK	57	18	38
FL	MELBOURNE	56	62	45
FL	MIAMI	2	47	19
FL	MIAMI	4	46	31
FL	MIAMI	6	41	47
FL	MIAMI	17	21	18
FL	MIAMI	23	24	22
FL	NAPLES	26	43	24
FL	NAPLES	46	18	43
FL	NEW SMYRNA BEACH	15	21	22
FL	OCALA	51	11	50
FL	ORANGE PARK	25	22	24
FL	ORLANDO	6	48	39
FL	ORLANDO	9	58	23
FL	ORLANDO	27	41	58
FL	ORLANDO	35	36	40
FL	ORLANDO	65	39	49
FL	PALM BEACH	61	36	27
FL	PANAMA CITY	7	8	20
FL	PANAMA CITY	13	30	24
FL	PANAMA CITY	28	20	32
FL	PANAMA CITY	56	22	42
FL	PANAMA CITY BEACH	46	14	45
FL	PENSACOLA	3	50	48
FL	PENSACOLA	23	27	30
FL	PENSACOLA	33	32	34
FL	PENSACOLA	44	45	26
FL	SARASOTA	40	24	18
FL	ST. PETERSBURG	10	19	21
FL	ST. PETERSBURG	38	25	19
FL	TALLAHASSEE	11	15	9
FL	TALLAHASSEE	27	26	22
FL	TAMPA	28	57	29
FL	TEQUESTA	25	40	59
FL	VENICE	62	42	25
FL	WEST PALM BEACH	5	19	48
FL	WEST PALM BEACH	42	59	41
GA	ALBANY	10	52	19
GA	ALBANY	31	32	30
GA	ATHENS	8	42	19
GA	ATLANTA	2	51	39
GA	ATLANTA	17	23	16
GA	ATLANTA	30	31	23
GA	ATLANTA	36	20	55
GA	ATLANTA	46	45	20
GA	ATLANTA	57	48	22
GA	ATLANTA	69	43	48
GA	AUGUSTA	6	44	43
GA	AUGUSTA	12	59	39
GA	BAINBRIDGE	49	50	48
GA	BAXLEY	34	25	35

ST	CITY	NTSC	FCC DTV	MOT DTV
GA	BRUNSWICK	21	19	20
GA	CHATSWORTH	18	28	29
GA	COLUMBUS	9	33	15
GA	COLUMBUS	28	27	18
GA	COLUMBUS	38	19	59
GA	COLUMBUS	54	44	49
GA	DALTON	23	16	15
GA	DAWSON	25	21	26
GA	MACON	13	35	42
GA	MACON	24	16	32
GA	MACON	64	14	31
GA	MONROE	63	26	51
GA	PERRY	58	49	45
GA	ROME	14	39	27
GA	SAVANNAH	3	45	49
GA	SAVANNAH	11	43	18
GA	SAVANNAH	22	31	23
GA	THOMASVILLE	6	36	33
GA	TOCCOA	32	19	44
GA	WRENS	20	17	21
IA	AMES	5	30	49
IA	CEDAR RAPIDS	2	42	50
IA	COUNCIL BLUFFS	32	33	31
IA	DAVENPORT	6	41	51
IA	DAVENPORT	18	21	56
IA	DES MOINES	11	10	29
IA	DES MOINES	13	29	10
IA	DES MOINES	17	26	16
IA	DES MOINES	63	50	26
IA	DUBUQUE	40	11	29
IA	MASON CITY	3	51	35
IA	RED OAK	36	35	24
IA	SIOUX CITY	4	46	41
IA	SIOUX CITY	9	31	30
IA	WATERLOO	7	16	30
ID	BOISE	2	26	24
ID	IDAHO FALLS	3	47	41
ID	MOSCOW	12	5	21
ID	NAMPA	6	25	49
ID	POCATELLO	6	41	51
ID	TWIN FALLS	35	34	36
IL	AURORA	60	47	29
IL	CHAMPAIGN	3	36	45
IL	CHARLESTON	51	31	52
IL	CHICAGO	5	29	25
IL	CHICAGO	7	25	52
IL	CHICAGO	9	19	57
IL	CHICAGO	11	69	59
IL	CHICAGO	44	65	43
IL	DECATUR	17	58	9
IL	EAST ST. LOUIS	46	47	19
IL	JOLIET	66	43	47
IL	MACOMB	22	23	21
IL	MOLINE	24	49	38
IL	MOUNT VERNON	13	18	26
IL	PEORIA	25	28	33
IL	PEORIA	47	57	46
IL	PEORIA	59	39	40
IL	QUINCY	10	38	53
IL	QUINCY	16	32	18
IL	QUINCY	27	19	28
IL	ROCK ISLAND	4	46	41
IL	ROCKFORD	17	54	19
IL	ROCKFORD	39	59	54
IL	SPRINGFIELD	20	40	58
IL	SPRINGFIELD	55	45	39
IL	URBANA	12	33	36
IL	URBANA	27	26	28
IN	ANGOLA	63	12	5
IN	BLOOMINGTON	4	47	25
IN	ELKHART	28	58	12
IN	EVANSVILLE	7	28	57
IN	EVANSVILLE	9	57	33
IN	EVANSVILLE	25	39	54
IN	FORT WAYNE	15	4	24
IN	FORT WAYNE	21	56	36
IN	FORT WAYNE	33	24	19
IN	FORT WAYNE	55	36	45
IN	INDIANAPOLIS	6	9	51
IN	INDIANAPOLIS	13	25	11
IN	INDIANAPOLIS	40	52	39
IN	KOKOMO	29	11	26
IN	LAFAYETTE	18	32	17
IN	MUNCIE	49	17	47
IN	RICHMOND	43	30	32
IN	SOUTH BEND	22	42	58
IN	SOUTH BEND	46	45	42
KS	COLBY	4	32	33
KS	ENSIGN	6	30	44
KS	GREAT BEND	2	46	43
KS	HUTCHINSON	12	19	26
KS	LAKIN	3	49	27
KS	SALINA	18	15	19
KS	TOPEKA	11	23	14
KS	WICHITA	10	28	31
KY	BOWLING GREEN	40	27	26
KY	DANVILLE	56	42	39
KY	ELIZABETHTOWN	23	51	47
KY	HARLAN	44	14	28
KY	HAZARD	35	53	14
KY	HAZARD	57	41	50
KY	LOUISVILLE	3	62	8
KY	LOUISVILLE	21	17	20
KY	LOUISVILLE	32	26	49
KY	LOUISVILLE	41	49	17
KY	MADISONVILLE	19	20	28
KY	MOREHEAD	67	21	51
KY	NEWPORT	19	20	29
KY	OWENSBORO	31	33	30
KY	PADUCAH	6	51	47
KY	PADUCAH	29	30	40
KY	PIKEVILLE	22	16	24
KY	SOMERSET	29	25	42
LA	ALEXANDRIA	5	43	36
LA	ALEXANDRIA	25	27	26
LA	ALEXANDRIA	31	30	32
LA	BATON ROUGE	9	42	30
LA	BATON ROUGE	27	14	29
LA	LAFAYETTE	3	41	42
LA	LAFAYETTE	10	22	41
LA	LAKE CHARLES	7	36	53
LA	LAKE CHARLES	18	28	19
LA	MONROE	8	35	43
LA	MONROE	13	19	35
LA	NEW ORLEANS	6	46	43
LA	NEW ORLEANS	8	30	11
LA	NEW ORLEANS	12	11	14
LA	NEW ORLEANS	26	24	15
LA	NEW ORLEANS	49	48	50
LA	SLIDELL	54	51	46
LA	WEST MONROE	14	18	22
MA	BOSTON	2	31	34
MA	BOSTON	4	23	43
MA	BOSTON	5	34	8
MA	BOSTON	7	65	59
MA	BOSTON	25	55	20
MA	BOSTON	44	43	55
MA	CAMBRIDGE	56	20	31
MA	LAWRENCE	62	59	32
MA	MARLBOROUGH	66	33	15
MA	NEW BEDFORD	28	52	3
MA	NORWELL	46	54	52
MA	SPRINGFIELD	22	51	21
MA	SPRINGFIELD	40	11	33
MA	VINEYARD HAVEN	58	22	26
MA	WORCESTER	27	67	54
MA	WORCESTER	48	47	51
MD	ANNAPOLIS	22	41	3
MD	BALTIMORE	13	40	39
MD	BALTIMORE	45	65	40
MD	BALTIMORE	54	39	10
MD	HAGERSTOWN	68	44	12
MD	OAKLAND	36	21	56
ME	AUGUSTA	10	29	23
ME	BIDDEFORD	26	45	3
MI	DETROIT	50	55	27
MI	GRAND RAPIDS	13	58	45
MI	GRAND RAPIDS	17	20	19
MI	GRAND RAPIDS	35	24	56
MI	KALAMAZOO	3	19	2
MI	KALAMAZOO	52	5	20
MI	SAGINAW	25	27	55
MN	ALEXANDRIA	42	28	24
MN	AUSTIN	6	35	51
MN	MANKATO	12	16	38
MN	ROCHESTER	10	36	36
MO	CAPE GIRARDEAU	12	32	18
MO	COLUMBIA	8	28	36
MO	COLUMBIA	17	18	20
MO	JEFFERSON CITY	25	20	26
MO	JOPLIN	16	14	36
MO	JOPLIN	26	25	24
MO	KANSAS CITY	5	46	44
MO	KANSAS CITY	9	24	23
MO	KANSAS CITY	19	26	21
MO	KANSAS CITY	50	21	51
MO	KIRKSVILLE	3	51	45
MO	POPLAR BLUFF	15	16	25
MO	SEDALIA	6	45	47
MO	SPRINGFIELD	3	44	39
MO	SPRINGFIELD	10	22	18
MO	SPRINGFIELD	21	23	22
MO	SPRINGFIELD	27	15	28
MO	SPRINGFIELD	33	32	15
MO	ST. JOSEPH	2	44	46
MO	ST. JOSEPH	16	14	25
MO	ST. LOUIS	4	34	38
MO	ST. LOUIS	5	48	35
MO	ST. LOUIS	9	26	34
MO	ST. LOUIS	11	35	32
MO	ST. LOUIS	30	21	31
MS	BILOXI	13	28	36
MS	BILOXI	19	18	16
MS	BOONEVILLE	12	32	22
MS	BUDE	17	15	18
MS	COLUMBUS	4	47	49
MS	GREENVILLE	15	17	21
MS	GREENWOOD	6	51	34
MS	GREENWOOD	23	24	25
MS	GULFPORT	25	16	27
MS	JACKSON	3	50	51

ST	CITY	NTSC	FCC DTV	MOT DTV
MS	JACKSON	12	38	42
MS	JACKSON	16	32	19
MS	JACKSON	29	26	28
MS	LAUREL	7	43	52
MS	MERIDIAN	11	34	35
MS	MERIDIAN	24	21	53
MS	MERIDIAN	30	19	32
MS	MISSISSIPPI STATE	2	49	47
MS	OXFORD	18	25	17
MS	WEST POINT	27	16	43
MT	BILLINGS	6	32	42
NC	ASHEVILLE	13	27	42
NC	ASHEVILLE	21	54	52
NC	ASHEVILLE	33	56	54
NC	GREENVILLE	9	58	41
NC	LINVILLE	17	59	43
NC	WINSTON-SALEM	26	66	30
NE	GRAND ISLAND	17	19	15
NE	HASTINGS	5	38	50
NE	HASTINGS	29	30	25
NE	HAYES CENTER	6	47	45
NE	LEXINGTON	3	44	30
NE	LINCOLN	10	25	33
NE	LINCOLN	12	40	35
NE	NORFOLK	19	16	32
NE	NORTH PLATTE	9	15	19
NE	OMAHA	6	51	40
NE	SCOTTSBLUFF	4	34	42
NH	CONCORD	21	24	53
NH	DERRY	50	32	18
NH	DURHAM	11	57	45
NH	MERRIMACK	60	18	24
NJ	WILDWOOD	40	34	41
NM	ALBUQUERQUE	23	24	22
NM	CLOVIS	12	21	15
NM	GALLUP	3	29	45
NM	LAS CRUCES	22	16	21
NM	LAS CRUCES	48	28	47
NM	ROSWELL	8	15	21
NM	ROSWELL	10	17	23
NV	HENDERSON	5	27	50
NV	LAS VEGAS	3	49	45
NV	RENO	2	39	41
NV	RENO	4	46	43
NV	RENO	5	43	50
NV	RENO	11	18	15
NV	RENO	27	28	7
NY	ALBANY	10	26	34
NY	ALBANY	23	21	53
NY	AMSTERDAM	55	49	32
NY	KINGSTON	62	69	26
NY	RIVERHEAD	55	10	12
NY	SCHENECTADY	6	34	12
NY	SCHENECTADY	45	25	49
OH	AKRON	49	46	29
OH	CHILLICOTHE	53	44	49
OH	CINCINNATI	5	39	31
OH	CINCINNATI	9	10	13
OH	CINCINNATI	12	31	10
OH	CINCINNATI	48	26	28
OH	CLEVELAND	3	41	39
OH	CLEVELAND	5	39	41
OH	COLUMBUS	4	12	14
OH	COLUMBUS	6	13	39
OH	COLUMBUS	28	56	36
OH	COLUMBUS	34	36	24
OH	DAYTON	22	3	58
OH	DAYTON	45	58	3
OH	LIMA	35	46	56
OH	LIMA	44	19	46
OH	NEWARK	51	24	45
OH	OXFORD	14	28	30
OH	PORTSMOUTH	42	17	21
OH	SHAKER HEIGHTS	19	20	56
OH	TOLEDO	11	66	34
OH	TOLEDO	13	42	12
OH	TOLEDO	24	34	17
OH	TOLEDO	30	29	49
OH	TOLEDO	36	17	42
OH	YOUNGSTOWN	21	36	20
OH	YOUNGSTOWN	27	29	15
OH	YOUNGSTOWN	33	34	36
OH	ZANESVILLE	18	40	12
OK	CLAREMORE	35	36	34
OK	EUFAULA	3	32	31
OK	OKLAHOMA CITY	52	17	36
OK	TULSA	2	50	49
OK	TULSA	6	49	38
OK	TULSA	11	38	55
OK	TULSA	53	31	50
OR	COOS BAY	11	21	15
OR	COOS BAY	23	22	24
OR	EUGENE	16	24	25
OR	KLAMATH FALLS	2	40	44
OR	KLAMATH FALLS	22	16	14
OR	LA GRANDE	13	8	5
OR	MEDFORD	8	15	38
OR	ROSEBURG	4	39	51
OR	ROSEBURG	36	25	21
PA	ALTOONA	47	48	39
PA	HARRISBURG	27	61	14
PA	JOHNSTOWN	6	28	29
PA	JOHNSTOWN	19	30	28
PA	LANCASTER	8	58	23
PA	LANCASTER	15	63	58
PA	PHILADELPHIA	3	64	59
PA	PHILADELPHIA	10	59	55
PA	PHILADELPHIA	17	55	64
PA	PITTSBURGH	16	54	43
PA	PITTSBURGH	53	43	48
RI	BLOCK ISLAND	69	21	45
RI	PROVIDENCE	10	15	23
SC	BEAUFORT	16	18	38
SC	CHARLESTON	24	42	34
SC	CHARLESTON	36	35	26
SC	COLUMBIA	10	8	44
SC	COLUMBIA	19	50	8
SC	COLUMBIA	25	23	59
SC	COLUMBIA	35	34	50
SC	GREENVILLE	4	60	9
SC	GREENVILLE	16	35	26
SC	GREENWOOD	38	52	18
SC	SPARTANBURG	49	43	34
SD	FLORENCE	3	32	34
SD	MITCHELL	5	48	49
SD	SIOUX FALLS	11	30	29
SD	SIOUX FALLS	13	29	33
SD	SIOUX FALLS	17	15	16
SD	SIOUX FALLS	23	24	15
TN	CHATTANOOGA	9	56	35
TN	CHATTANOOGA	12	41	59
TN	CHATTANOOGA	45	44	34
TN	CHATTANOOGA	61	40	33
TN	COOKEVILLE	22	52	55
TN	COOKEVILLE	28	11	16
TN	CROSSVILLE	20	35	24
TN	GREENEVILLE	39	42	27
TN	HENDERSONVILLE	50	14	51
TN	JACKSON	7	28	38
TN	JACKSON	16	38	9
TN	JELLICO	54	33	41
TN	JOHNSON CITY	11	12	59
TN	KNOXVILLE	15	36	17
TN	KNOXVILLE	43	17	36
TN	LEBANON	66	32	25
TN	LEXINGTON	11	41	34
TN	MEMPHIS	3	43	35
TN	MEMPHIS	5	34	32
TN	MEMPHIS	10	29	33
TN	MEMPHIS	13	33	28
TN	MEMPHIS	50	21	51
TN	NASHVILLE	2	47	43
TN	NASHVILLE	4	42	10
TN	NASHVILLE	8	55	56
TN	NASHVILLE	17	26	27
TN	NASHVILLE	30	10	14
TN	NASHVILLE	58	43	44
TN	SNEEDVILLE	2	24	23
TX	AUSTIN	18	22	20
TX	BAYTOWN	57	43	33
TX	BEAUMONT	34	33	25
TX	BROWNSVILLE	23	58	24
TX	CORPUS CHRISTI	3	43	32
TX	CORPUS CHRISTI	6	47	34
TX	CORPUS CHRISTI	10	32	21
TX	EL PASO	4	50	51
TX	EL PASO	7	53	16
TX	EL PASO	9	36	17
TX	EL PASO	13	54	18
TX	EL PASO	14	60	15
TX	EL PASO	26	51	25
TX	EL PASO	38	67	39
TX	EL PASO	65	39	19
TX	HARLINGEN	44	34	43
TX	HARLINGEN	60	61	51
TX	HOUSTON	14	24	36
TX	HOUSTON	20	19	24
TX	LAREDO	13	54	15
TX	LAREDO	27	25	20
TX	LONGVIEW	51	52	27
TX	LUFKIN	9	15	54
TX	MCALLEN	48	30	47
TX	NACOGDOCHES	19	25	15
TX	SAN ANTONIO	23	19	16
TX	SAN ANTONIO	41	16	19
TX	TYLER	7	22	28
TX	WACO	44	20	22
TX	WESLACO	5	20	18
TX	WICHITA FALLS	18	15	17
UT	SALT LAKE CITY	2	43	49
UT	SALT LAKE CITY	4	51	50
UT	SALT LAKE CITY	5	48	45
VA	BRISTOL	5	23	32
VA	CHARLOTTESVILLE	29	28	49
VA	CHARLOTTESVILLE	41	32	28
VA	FAIRFAX	56	48	36
VA	FRONT ROYAL	42	23	21
VA	GOLDVEIN	53	46	44
VA	GRUNDY	68	50	49
VA	LYNCHBURG	13	49	17
VA	LYNCHBURG	21	3	48

ST	CITY	NTSC	FCC DTV	MOT DTV
VA	MARION	52	48	46
VA	NORFOLK	3	39	31
VA	NORTON	47	32	16
VA	RICHMOND	6	31	39
VA	ROANOKE	7	18	14
VA	ROANOKE	15	17	50
VA	ROANOKE	27	14	3
VA	STAUNTON	51	50	25
VT	WINDSOR	41	58	47
WA	EVERETT	16	35	31
WA	SEATTLE	7	53	14
WA	SPOKANE	2	65	39
WA	SPOKANE	6	39	20
WA	TACOMA	11	14	53
WA	YAKIMA	29	52	33
WI	EAU CLAIRE	13	18	42
WI	GREEN BAY	5	45	29
WI	LA CROSSE	8	43	16
WI	LA CROSSE	31	36	39
WI	MADISON	3	29	43
WI	MADISON	15	19	11
WI	SUPERIOR	6	47	43
WV	BLUEFIELD	40	46	18
WV	CHARLESTON	8	58	43
WV	CLARKSBURG	12	52	32
WV	CLARKSBURG	46	45	41
WV	GRANDVIEW	9	31	53
WV	HUNTINGTON	3	49	48
WV	HUNTINGTON	13	55	17
WV	HUNTINGTON	33	54	44
WV	LEWISBURG	59	25	42
WV	MARTINSBURG	60	12	46
WV	MORGANTOWN	24	33	30
WV	OAK HILL	4	43	31
WV	PARKERSBURG	15	32	52
WV	WHEELING	7	56	34
WY	CHEYENNE	5	51	46
WY	JACKSON	2	25	14

* These stations are in the FCC database, but are not contained within Appendix B of the Sixth Further Notice of MM Docket No. 87-268.

APPENDIX B

TV Interference To Land Mobile

ABSTRACT

The potential interference from a DTV transmitter operating co-channel and or adjacent-channel into Land Mobile (LM) receivers has been computed, and severe interference can result from station allotments proposed by the Commission in the Sixth Further Notice of Proposed Rule Making in MM Docket No. 87-268. There are economically viable technological solutions that can be applied to reduce such interference to acceptable levels in most cases. Therefore, it is recommended that the existing FCC rule Section 73.687(E)(4) be extended to apply to all new TV stations operating on TV channels 14-21.

1.0 INTRODUCTION

The FCC has proposed that DTV channels be allocated in TV channels 14 through 21. In the Sixth Further Notice, FCC 96-317, it states:

> We will therefore continue to propose to permit DTV stations to operate at co-channel and adjacent channel spacings to the city-center of land mobile operations as close as 250 km (155 miles) and 176 km (110 miles) ... We specifically invite comment and suggestions regarding the additional conditions that would be applied in cases where the proposed spacing standards cannot be met and the manner in which such conditions should be applied to achieve an appropriate balance between DTV and land mobile interests.

In footnote 96 of the Sixth Further Notice, as amended, there is a list of one co-channel and 12 adjacent channel cases where the spacing standards are not met in the proposed allocation table that is subsequently presented in Appendix B of the Notice. These are shown in Table B-1 below. Also shown in Table B-1 is LM channel 16 in New York which is presently used by public safety, and for which some provision was made in the implementation of the allocations. The LM licensees assigned in these channels may encounter interference that can severely degrade the performance of their systems.

TABLE B-1

CHANNEL NTSC	DTV	DTV CITY LOCATION	CO/ADJ LM CHANNEL	LM CITY LOCATION	SEPARATION, km(MILES)
8	16	New Haven, CT	CO 16	Boston, MA	188(117)
52	15	Los Angeles, CA	ADJ 14/16	Los Angeles, CA	25(16)
14	15	San Mateo, CA	ADJ 16	San Francisco, CA	10(6)
10	15	Providence, RI	ADJ 14/16	Boston, MA	58(36)
8	16	New Haven, CT	ADJ 15	New York, NY	115(71)
62	16	Frederic, MD	ADJ 17	Washington, DC	53(33)
55	16	Kenosha, WI	ADJ 15	Chicago, IL	74(46)
9	17	Manchester, NH	ADJ 16	Boston, MA	82(51)
4	18	San Francisco, CA	ADJ 17	San Francisco, CA	4(3)
9	18	Secaucus, NJ	ADJ 19	Philadelphia, PA	129(80)
18	19	San Bernardino, CA	ADJ 20	Los Angeles, CA	53(32)
13	21	Los Angeles, CA	ADJ 20	Los Angeles	25(16)
65	21	Vineland, NJ	ADJ 20	Philadelphia, PA	36(22)
8	16	New Haven, CT	CO 16	New York, NY	111(69)

The geographic separation of the proposed DTV stations is, as the Sixth Further Notice stated, less than the proposed spacing standards. In at least two cases, the proposed DTV station is within the same metropolitan area. On the surface, the possibility for interference appears to be very high.

In this appendix we will compute the interference close spacing may produce in LM receivers and discuss the ramifications of such interference. Some possible ways that the interference can be reduced will be proposed, and in cases where it remains too high, recommendations will be made for mitigation of the interference by other means.

2.0 DTV INTERFERENCE SOURCE

2.1 Measured Spectrum

Figure B1 shows the measured spectrum of the channel 53 DTV signal, after the band pass filter, that was tested last year in Charlotte, NC. The Occupied Bandwidth is reported to be 5.38 MHz, and the small peak on the left side is the pilot carrier. This spectrum was measured in the peak mode on a TEK 2712 spectrum analyzer. It is reported that the peak to average ratio is 6.5 dB, and for this analysis, we will assume that the signal is noise like. It is evident from inspection that the signal is approximately flat over the occupied bandwidth.

This signal was measured with a 300 kHz resolution bandwidth, but the relative difference between that and the signal measured with a narrower resolution bandwidth will be assumed to be about the same (i.e. the picture will look the same, except the levels will change by a constant 10 dB). The one area where a small difference will appear is on the large slope near the DTV band edges where the width of the spectrum will be reduced by about half of the difference between the 300 kHz resolution bandwidth and the narrower bandwidth.

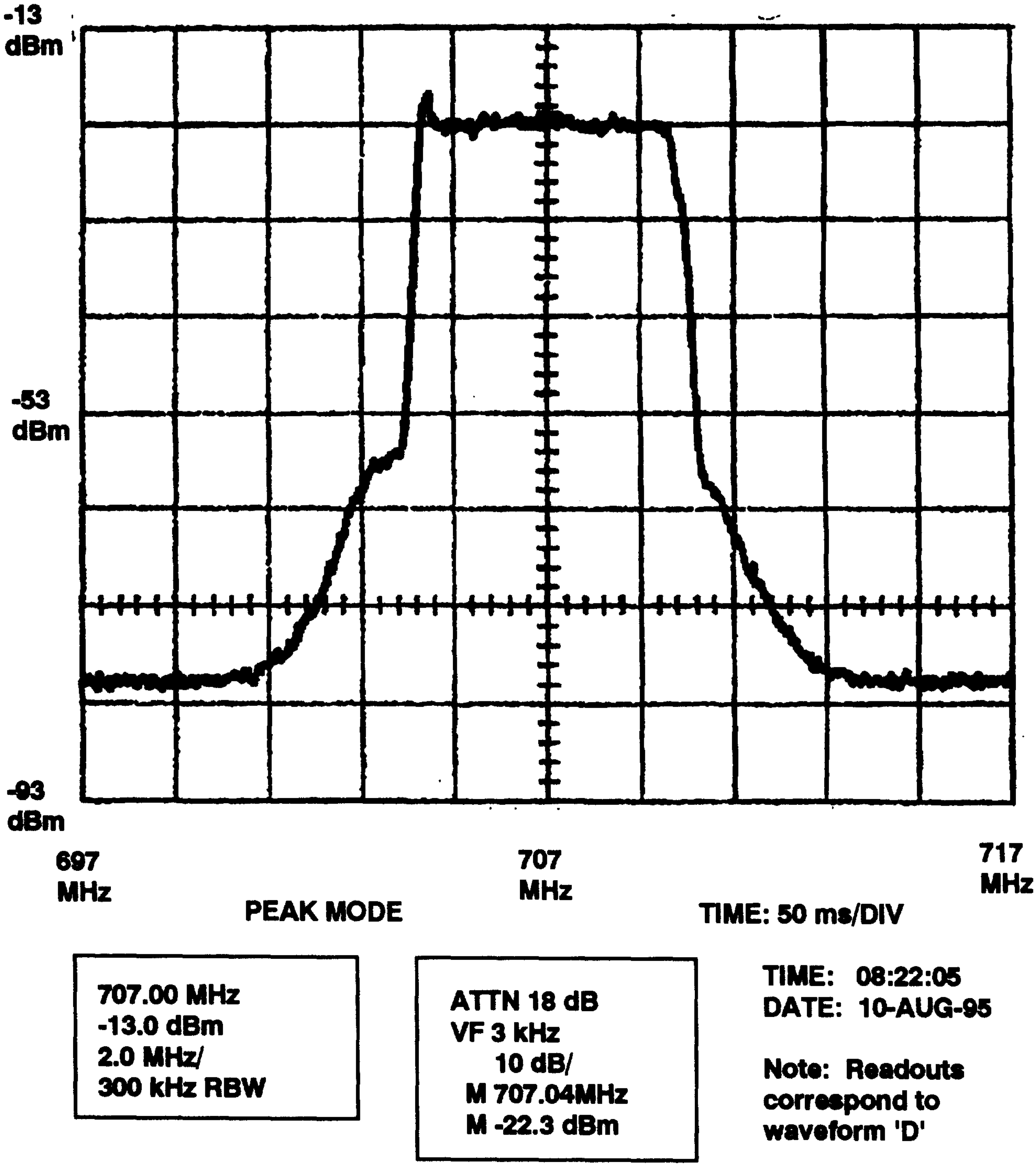

Figure B1 Spectrum of Channel 53 Grand Alliance DTV Signal

2.2 Proposed Mask

The Fifth Further Notice of Proposed Rule Making, FCC 96-207 proposes a specification for the out of band performance for DTV transmitters, and Figure B2 shows the mask that results. The measurement bandwidth was specified as 500 kHz, and the equation for the mask, where A is the attenuation in dB and f is the frequency referenced to the center of the band is:

$A = 0$	$-3 < f < 3$
$A = -35 - (\lvert f \rvert - 3)^2 / 1.44$	$-9 < f < -3, \; 3 < f < 9$
$A = -60$	$-\infty < f < -9, \; 9 < f < \infty$

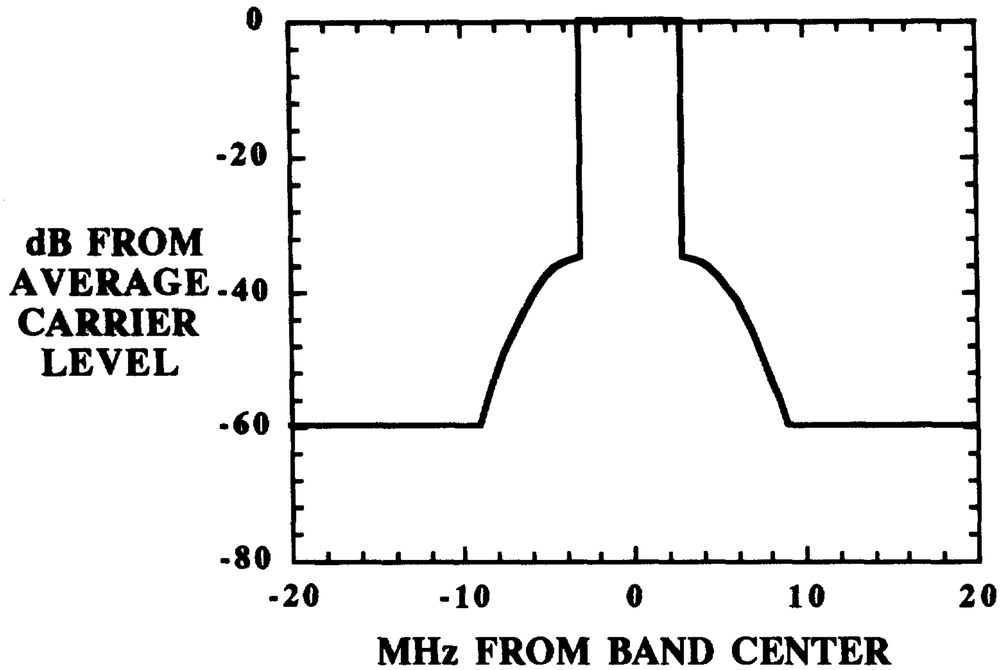

Figure B2 ATSC Standard Mask for DTV

The spectrum in Figure B1 appears to very closely fit within the mask of Figure B2, though we note that the resolution bandwidth of the analyzer was less than the proposed requirement of 500 kHz. However, we consider the Figure B1 spectrum a work in process. It is reported that efforts are under way to reduce the out of band emissions by direct means within the transmitter. Then RF filtering after the transmitter may not be necessary to bring the adjacent-channel performance within the proposed mask, and the spectrum produced will not be as shown in the Figure. However, it is not clear how it will be possible to meet the Intermodulation (IM)[32] performance necessary in the transmitter without such filters. So the final spectrum shape is not known at this time

[32] Intermodulation occurs in a transmitter when two or more signals are present and encounter non-linearitys therein. The most troublesome is called third order intermodulation where two new signals are produced with frequencies that are the sum and difference of the frequencies of the signals impressed on the non-linearity. These can fall on the frequency of a nearby land mobile or other receiver and cause significant interference.

Further, the Commission stated in FCC 96-207[33] that the mask may be required to be changed. So, the final mask as well as the final spectrum are not known at this time. However, the data in Figures B1 and B2 show a certain capability, and will form the basis for the analysis reported herein.

Co-channel interference comes directly into the LM receiver with the full power of the portion of the DTV transmitter that is within the IF bandwidth of it's receiver. This energy is limited only by the path loss between the two stations, the polarization of the wave as it propagates, and the gain and polarization characteristics of the transmitting and receiving antennas.

Adjacent-channel interference comes from the energy in the side bands of the spectrum of the DTV transmitter that also comes directly into the LM receiver. This energy is limited by the same factors that limit co-channel interference, but in addition, it is limited by the ratio of energy in band to that out of band. Each of these will now be analyzed in turn.

3.0 CO-CHANNEL INTERFERENCE

Co-channel interference depends on the ERP of the DTV transmitter and the amount of that DTV signal that is within the narrow band IF of the LM receiver. Therefore, it is dependent on the gain of the LM antenna, propagation loss between the antennas of the two stations, and the polarization characteristics of the antennas of the two stations and of the medium between them. The most sensitive LM in the receiver, and the one which is at the greatest height is located at the LM base station. The typical antenna height varies from a low of about 200 feet in small suburbs to a high of several thousand feet when the station is located on a mountain top such as Mount Wilson in Los Angeles, CA. The factors presented here will be investigated in turn to determine the effect on LM base performance.

3.1 DTV Power

The ERP will be different for each DTV station, and ranges upward to 5 MW in the allocation table in Sixth Further Notice. However, there is serious work going on to decrease the DTV receiver noise figure so that the ERP can be reducing by 3 dB to 2.5 MW. So, for the analysis herein, 2.5 MW will be used to as a straw person.

3.2 LM Bandwidth

The typical bandwidth of LM receivers is about 15 kHz. The in band energy of the DTV spectrum is approximately flat over the occupied bandwidth of the signal, so the portion of the DTV transmitter power that is delivered to the LM receiver is reduced by the ratio of the LM bandwidth to the DTV occupied bandwidth. The rejection of a DTV signal by the IF of a LM receiver is thus:

$$\text{DTV O.B. into LM IF} = 10\log(15/5380) = -25.6\ \text{dB}$$

[33] Specifically, in paragraph 56 of the notice it says "If DTV stations are permitted to operate in a co-located adjacent channel arrangement with average DTV power exceeding that assumed value (12 dB below the co-located NTSC station's ERP), greater attenuation of the out-of-band emissions may be required."

3.3 LM Base Antenna

The gain of typical LM base antennas is 8 to 12 dB in the UHF bands; we will use 9 dB in this analysis. There is a loss in the transmission line that connects the antenna to the base receiver, and 2 dB will be assumed for this analysis.

3.4 Propagation Loss

The propagation loss depends on the separation between the antennas. For most cases of co-channel separations that can be considered reasonable, the path is not line of sight. So, for the analysis herein, the F(50,10) curves in FCC report R-6602 as implemented on a computer will be used.[34] The frequency of operation used in the analysis will be the center of the 470 to 512 MHz LM - TV sharing band, 491 MHz.

3.5 LM Base Height

The R-6602 propagation curves presume that the receiver is located at a height of 30 feet. However, as stated above, the LM base is at a much greater height. In order to scope the problem, we will assume that the LM base antenna is located at a height of 1000 feet. A 6 dB reduction in path loss for each doubling of height will be used for this analysis, and the correction that results is 20 log(1000/30) = 30.5 dB.

3.6 LM to DTV Geographic Separation

For this general analysis, the separation between the LM and DTV stations that will be used is the standard co-channel spacing as stated in FCC 95-317; this is 250 km. Typical heights of existing NTSC stations also vary, but in general they are higher than LM stations. For the general analysis herein, a HAAT of 2000 feet will be used. It is noted that this is the proposed "maximum permissible specification" for HAAT for future DTV allotments

3.7 Polarization

LM antennas are vertically polarized, with typical cross polarized response from -10 to -30 dB. TV antennas were historically horizontally polarized, and the cross polarized signal was 20 to 40 dB below it. But circular polarization has been used of late where there is 0 dB between the horizontal and vertical signals. Also, there are TV transmitter antenna designs that radiate horizontal polarization in the horizontal plane, but off axis, at significant angles up or down there can be a vertically polarized component that is only -6 dB from the Horizontal.[35] For this general analysis, we will use 20 dB of cross polarization protection, and recognize that each specific case, where a potential problem exists, will need to be studied in detail.

[34] Algorithm for Computing Field Strength for FM and TV Stations, MM 88-56, November 1987.

[35] Such antennas as the Zig Zag antenna sold by RCA and the Helical antenna sold by GE in the 1960's fall into this category. There is a vertical component to the radiating element of these antennas, and alternating segments of that vertical component are out of phase. In the horizontal plane, they therefore cancel, but off axis the space phase does not permit that cancellation.

3.8 Co-Channel Computation

The co-channel interference power can now be computed using the factors that have been developed.

2.5 MW DTV transmitted ERP	94.0	dBm
Coupled into LM IF	-25.6	dB
Cross Polarization	-20.0	dB
F(50,10) Path Loss @ 250 km, 2000 ft	-179.2	dBd
LM Antenna Height Correction	30.5	dB
Land Mobile antenna Gain	9	dBd
Land Mobile Coax loss	-2	dB
Received DTV interference power	-93.3	dBm

This computation was made using the F(50,10) curves where 50 percent of the locations receive the stated level of interference 10 percent of the time. This level of interference is very severe considering that the typical sensitivity of a LM base receiver used in the UHF frequency band is 0.5 µV or -113 dBm. However, because of Rayleigh multipath fading, the useful sensitivity is degraded by 10 dB to -103 dBm. In order to obtain this sensitivity it is necessary to have a Signal to Noise plus Interference ratio [S/(I+N)] of about 7 dB or at a level of -110 dBm. Thus, the computed received interference power would degrade a LM base receiver by a total of 110 - 93.3 = 16.7 dB. In the future, as digital systems become more common, a higher S/(I+N) will probably be required, and this will only make the situation worse.

3.9 The Effect of Co-Channel Interference

LM receivers at the heights described herein are used in two frequency repeaters. These high sites permit wide area coverage over a metropolitan area, typically 30 to 40 miles in radius. In this way, cost effective communications are provided to the users for dispatch service. Such a situation is shown in Figure B3. There are several mobile radios that can communicate through the repeater when there is no interference. When there is interference at the base site, the interference reduces the range of coverage, and it is possible that some of the units will not be able to communicate. By geometry, with a reduction of 29 percent in range, the area of coverage will be cut in half.

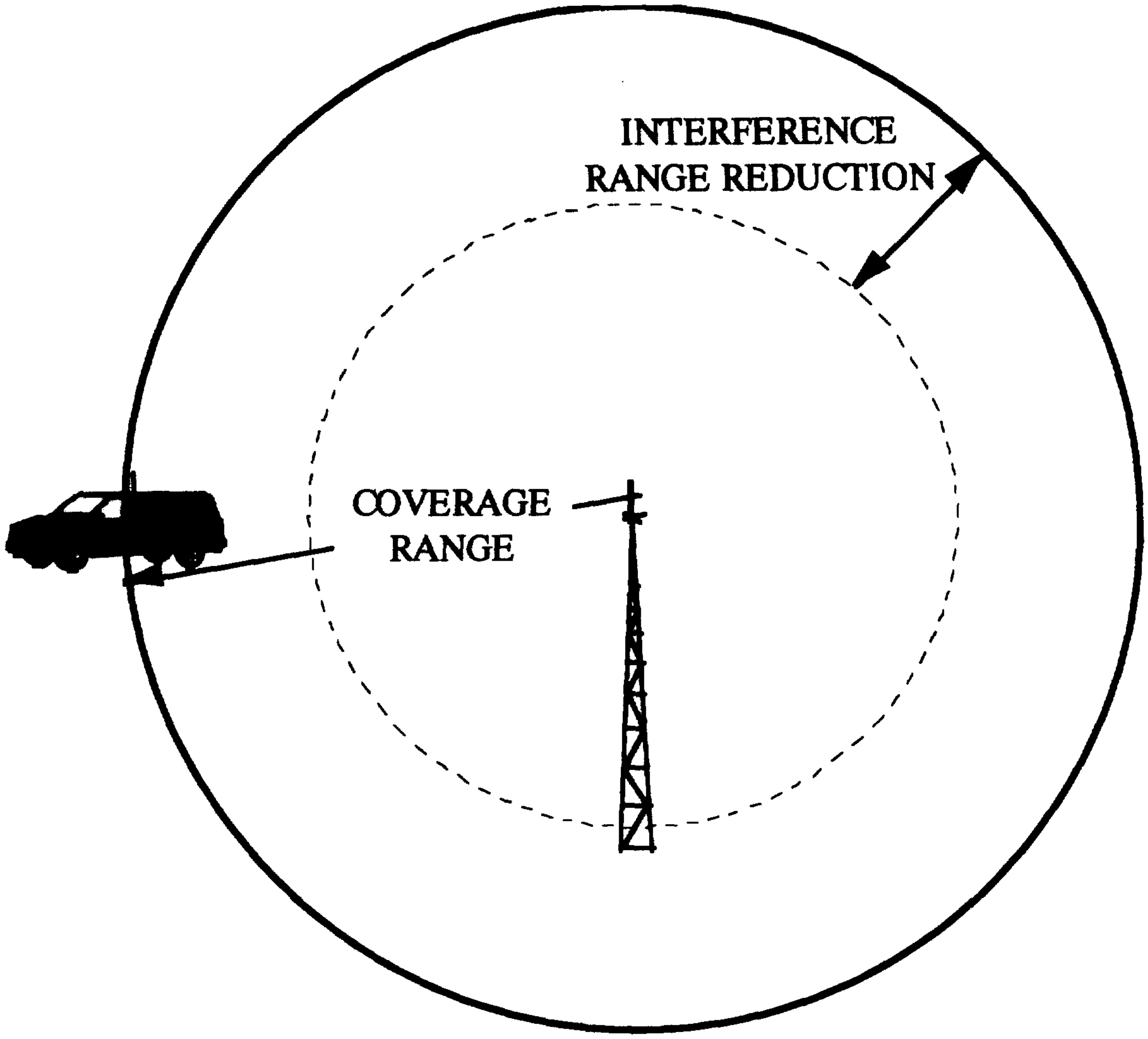

Figure B3 Interference Range Reduction Illustrated

3.10 Proposed Close Co-Channel Stations
The one reported case of co-channel interference that does not meet the spacing standard set up by the FCC is between LM use of channel 16 in Boston, MA and New Haven CO which are separated by 188 km (117 mi.). A potential second case is Channel 16 that is presently used by public safety in New York City. And finally, there are several DTV stations that are assigned co-channel to LM licensees that are spaced less than the spacing that has historically been used, 340 km (212 mi.). These include the use of:

channel 15 in Lansing, MI	LM in Chicago at 286 km (178 mi.)
channel 18 in Roanoke, VT	LM in Washington, DC at 333 km (207 mi.)
channel 15 in Providence, RI	LM in New York at 254 km (157 mi.)
channel 14 in El Centro, CA	LM in Los Angeles at 336 km (210 mi.)
channel 16 in Yuma, CA	LM in Los Angeles at 335 km (209 mi.)
channel 14 in St. Petersburg, FL	LM in Miami at 307 km (191 mi.)

There are other proposed co-channel assignments that are at a spacing less than 340 km, but they all involve a proposed DTV ERP that is below 300 kW. However, there is potential interference for the LM stations involved in the list above. Detailed analysis could be made, but the exact parameters for the DTV station are unknown at this point. These include antenna horizontal directivity, polarization, final power, etc.

3.11 Recommended Co-channel Interference Criteria

There have been cases of interference of TV transmitters in the past, on an adjacent channel basis. The present FCC rules in §73.687(E)(4) only allow 17 dBμ of vertically polarized field strength within a 30 kHz wide bandwidth including the LM receiver at the LM site from TV channel 14 and 69 NTSC transmitters. Conversion of that field strength to power into a matched 50 ohm dipole and using the 9 dB of antenna gain and 2 dB of transmission line loss above yields a signal of -107 dBm into a 15 kHz LM IF. This would result in a degradation of sensitivity in the case above of 3 dB, and this is probably acceptable. Therefore, it is recommended that this rule be implemented to include co-channel operation of DTV transmitters in the channel 14 through 20 bands.

3.12 Interference Mediation

It is believed that technological solutions exist that can permit DTV stations to operate at the spacings shown above within the recommended criteria. Horizontal directivity can be used to reduce the signal radiated from the proposed DTV transmitters in the direction of the LM sites. The use of high vertical gain DTV antennas with beam tilt down may be possible in some cases on high sites. Further, it may be possible to take advantage of terrain features to optimize the path loss between the DTV and LM stations. And finally, in some cases it may be necessary to reduce the transmitted power somewhat to affect acceptable performance.

4.0 ADJACENT-CHANNEL INTERFERENCE

The out of band interfering signal from a DTV transmitter is determined by the same factors that determine the co-channel signal, and in addition by the ratio of DTV in band to out of band spectrum levels (at the frequency of the LM victim receiver).

4.1 Adjacent Channel Protection

From the spectrum in Figure B1 and the mask in Figure B2, the level of the energy just adjacent to the DTV channel is 35 dB from the average level of the in band signal. With this factor, and the material above, we can now compute the received signal from a DTV adjacent channel transmitter at the specified separation of 176 km.

4.2 Adjacent Channel Computation

2.5 MW DTV transmitted ERP	94.0	dBm
Out of band emissions	-35	dB
Coupling into LM IF	-25.6	dB
Cross Polarization	-20.0	dB
F(50,10) Path Loss @ 176 km, 2000 ft	-166.7	dBd
LM Antenna Height Correction	30.5	dB
Land Mobile antenna Gain	9	dBd
Land Mobile Coax loss	-2	dB
Received DTV interference power	-115.8	dBm

It thus appears that the separation standard for adjacent channel performance of DTV into LM is adequate for the effective receiver sensitivity of -103 dBm and interference power of -110 dBm described above. However, as the spacing is reduced, there comes a point where there is not enough isolation between the two. Figure B4 shows the F(50,10) path loss between the two assumed stations using the R-6602 curves obtained from the reference in footnote 3. The spacing at which the path loss is reduced by 5.8 dB to 160.9 dBd and therefore the interference power is increased by 5.8 dB to -110 dBm is 92.2 miles (148.4 km).

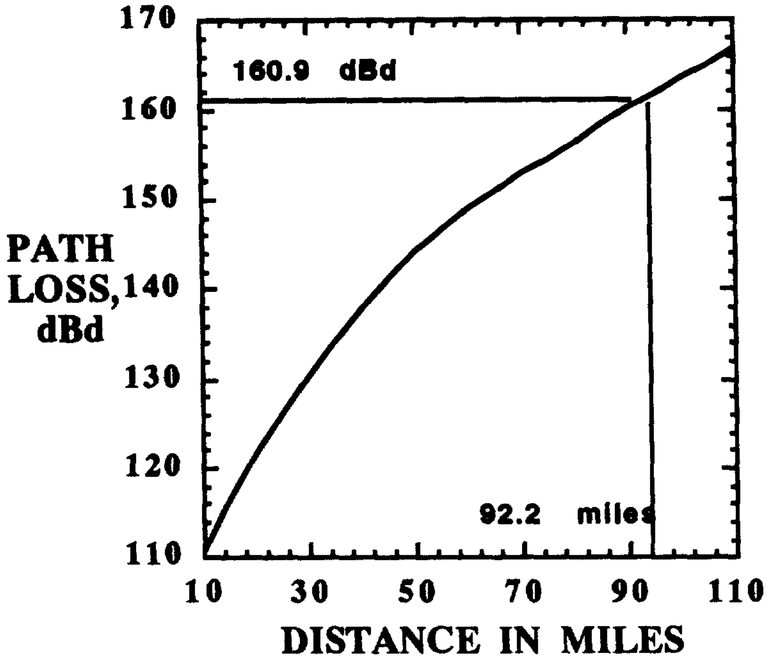

Figure B4 F(50,10) Path Loss Between 1000 and 30 Foot High Antennas

4.3 Proposed Adjacent-Channel Short Spaced Stations

The list of stations proposed by the FCC is shown in Table B1, These include one DTV station that is only 3 miles (4 km) from the center of the LM city of San Francisco, CA. If a LM station were located at the center of the city, the F(50,10) path loss would be less than 110.6 dBd as shown at 10 miles in Figure B4 above.

The total path loss between antennas includes that labeled F(50,10) and labeled LM Antenna Height Correction in the preceding computation. Path loss that is this small only occurs 10 percent of the time and results from ducting or two path addition at the receiving antenna. At geographic spacings that are equal to or smaller than the line of sight between the antennas, the height correction is reduced from that computed from the 6 dB per doubling algorithm used previously. At the assumed antenna heights used herein, 2000 and 1000 feet for DTV and LM respectively, and spacings less than 30 miles, the height correction is essentially zero. Using the procedure in section 4.2 with this change, the total received interfering signal, at or less than the 10 mile spacing, is -90.2 dBm or greater. Any such LM station, therefore, would experience severe and unacceptable interference.

4.4 Recommended Adjacent-Channel Interference Criteria

Not all DTV stations will be located nearby LM facilities, therefore it is not prudent nor necessary to reduce the adjacent channel levels in the proposed FCC mask. However, some action is indicated. The criteria in the present FCC rules in §73.687(E)(4) are therefore also recommended for use in this co-adjacent channel case as they were for the co-channel case discussed previously. Any LM station experiencing interference would thus have the same recourse to turn to.

4.5 Interference Mediation

In addition to the techniques described for co-channel stations, there is the possibility that RF filtering can be used. This solution has been used on NTSC stations in the past, and it is believed that it can be used for some level of protection for DTV. There are several practical implementation issues about the filter response for linear signals that must be resolved. But a band pass filter was successfully used on the DTV test transmitter in the Charlotte tests, so it is only real question is what level of filtering can be provided.

There are some LM facilities that are less than 10 miles from proposed DTV stations. In a few such extreme cases it is not feasible from a technical standpoint to provide enough filtering to bring the interference to an acceptable level. Therefore, the only possible solution would be for the LM licensee to be retuned to an acceptable vacant nearby channel, if any are available, farther away from the DTV station where interference is not a problem. The expenses for such a retuning would be born by the TV station.

5.0 CONCLUSION

The potential interference from a DTV transmitter operating co-channel and adjacent-channel into Land Mobile base receivers has been computed, and severe interference can result from station allocations proposed by the Commission. There are economically viable technological solutions that can be applied to reduce most such interference to acceptable levels on the channel presently occupied by the LM licensee. Therefore, it is recommended that the existing FCC rules in CFR 47 part 73 paragraph 687(E)(4) be extended to apply to all new TV stations operating on TV channels 14-21 both co-channel and adjacent channel to LM stations.

In extreme cases, where such solutions are not feasible from a technical basis and there is agreement between the parties involved, it is recommended that the LM licensee be retuned to an acceptable vacant nearby channel where interference is not a problem, with reasonable expenses to be born by the TV station.

CERTIFICATE OF SERVICE

I, Tanya R. Mason, of Motorola Inc. do hereby certify that on this 22nd day of November, 1996 a copy of the foregoing "Comments" was sent to each of the following by hand:

Tanya R. Mason

Tanya R. Mason

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